

**What Is Claimed Is:**

1        1. A method for providing concurrency control for a policy-based  
2 management system that controls resources in a distributed computing system, the  
3 method comprising:

4            receiving a request to perform an operation on a lockable resource from a  
5 controller in the distributed computing system;

6            wherein the controller sends the request in order to enforce a first policy  
7 for controlling resources in the distributed computing system;

8            determining whether the controller holds a lock on the lockable resource;

9            allowing the controller to execute the operation on the lockable resource if  
10 the controller holds the lock on the lockable resource;

11            allowing the controller to acquire the lock if the controller does not hold  
12 the lock on the lockable resource; and

13            allowing the controller to execute the operation on the lockable resource if  
14 the controller acquires the lock.

1        2. The method of claim 1, wherein the first policy is configured to  
2 command resources in the distributed computing system to perform actions so that  
3 the distributed computing system operates in accordance with a rule that is  
4 enforced by the first policy, wherein the rule governs behavior of resources within  
5 the distributed computing system.

1        3. The method of claim 1, further comprising throwing an exception  
2 if the controller does not hold the lock on the lockable resource and if the  
3 controller does not acquire the lock.

1           4.     The method of claim 1, wherein the lock held on the lockable  
2 resource expires after a pre-specified lease period, unless the lease is renewed  
3 within the pre-specified lease period.

1           5.     The method of claim 1, wherein the lockable resource includes a  
2 resource within the distributed computing system.

1           6.     The method of claim 1, wherein the lockable resource includes a  
2 second policy for controlling resources in the distributed computing system.

1           7.     The method of claim 1, wherein the controller includes a client in  
2 the distributed computing system.

1           8.     The method of claim 1, wherein the controller includes the first  
2 policy for controlling resources in the distributed computing system.

1           9.     The method of claim 1, wherein the controller includes a higher-  
2 level policy for controlling resources in the distributed computing system, and  
3 wherein the lockable resource includes a lower-level policy for controlling  
4 resources in the distributed computing system.

1           10.    The method of claim 1, wherein allowing the controller to acquire  
2 the lock includes allowing the controller to acquire the lock from a resource that  
3 allocates locks to controllers.

1        11. The method of claim 1, wherein the lockable resource presents one  
2 or more independent locks ~~providing access to independent sub-units of the~~  
3 resource.

1        12. A computer-readable storage medium storing instructions that  
2 when executed by a computer cause the computer to perform a method for  
3 providing concurrency control for a policy-based management system that  
4 controls resources in a distributed computing system, the method comprising:  
5            receiving a request to perform an operation on a lockable resource from a  
6 controller in the distributed computing system;  
7            wherein the controller sends the request in order to enforce a first policy  
8 for controlling resources in the distributed computing system;  
9            determining whether the controller holds a lock on the lockable resource;  
10            allowing the controller to execute the operation on the lockable resource if  
11 the controller holds the lock on the lockable resource;  
12            allowing the controller to acquire the lock if the controller does not hold  
13 the lock on the lockable resource; and  
14            allowing the controller to execute the operation on the lockable resource if  
15 the controller acquires the lock.

1        13. The computer-readable storage medium of claim 12, wherein the  
2 first policy is configured to command resources in the distributed computing  
3 system to perform actions so that the distributed computing system operates in  
4 accordance with a rule that is enforced by the first policy, wherein the rule  
5 governs behavior of resources within the distributed computing system.

1           14. The computer-readable storage medium of claim 12, wherein the  
2 method further comprises throwing an exception if the controller does not hold  
3 the lock on the lockable resource and if the controller does not acquire the lock.

1           15. The computer-readable storage medium of claim 12, wherein locks  
2 held by the controller expire after a pre-specified lease period, unless the lease is  
3 renewed within the pre-specified lease period.

1           16. An apparatus that provides concurrency control within a policy-  
2 based management system that controls resources in a distributed computing  
3 system, the apparatus comprising:

4           a receiving mechanism that receives a request to perform an operation on a  
5 lockable resource from a controller in the distributed computing system;

6           wherein the controller sends the request in order to enforce a first policy  
7 for controlling resources in the distributed computing system;

8           a determining mechanism that determines whether the controller holds a  
9 lock on the lockable resource;

10           an execution mechanism that is configured to,

11           allow the controller to acquire the lock if the controller  
12 does not hold the lock on the lockable resource, and to

13           allow the controller to execute the operation on the lockable  
14 resource if the controller holds the lock on the lockable resource.

1           17. The apparatus of claim 16, wherein the first policy is configured to  
2 command resources in the distributed computing system to perform actions so that  
3 the distributed computing system operates in accordance with a rule that is

4 enforced by the first policy, wherein the rule governs behavior of resources within  
5 the distributed computing system.

1 18. The apparatus of claim 16, wherein the execution mechanism is  
2 configured to throw an exception if the controller does not hold the lock on the  
3 lockable resource and if the controller does not acquire the lock.

1 19. The apparatus of claim 16, wherein the lock on the lockable  
2 resource expires after a pre-specified lease period, unless the lease is renewed  
3 within the pre-specified lease period.

1 20. The apparatus of claim 16, wherein the lockable resource includes  
2 a resource within the distributed computing system.

1 21. The apparatus of claim 16, wherein the lockable resource includes  
2 a second policy for controlling resources in the distributed computing system.

1 22. The apparatus of claim 16, wherein the controller includes a client  
2 in the distributed computing system.

1 23. The apparatus of claim 16, wherein the controller includes the first  
2 policy for controlling resources in the distributed computing system.

1 24. The apparatus of claim 16, wherein the controller includes a  
2 higher-level policy for controlling resources in the distributed computing system,  
3 and wherein the lockable resource includes a lower-level policy for controlling  
4 resources in the distributed computing system.

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1        25. The apparatus of claim 16, wherein the execution mechanism is  
2 configured to allow the controller to acquire the lock from a resource that  
3 allocates locks to controllers.

1        26. The apparatus of claim 16, wherein the lockable resource presents  
2 one or more independent locks providing access to independent sub-units of the  
3 resource.